MARYLAND'S IRON INDUSTRY DURING THE REVOLUTIONARY WAR ERA

MARYLAND BICENTENNIAL
COMMISSION

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A Report Prepared

for the Maryland Bicentennial Commission

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THE MARYLAND IRON INDUSTRY

Importance

Iron-making is a fundamental industry. In every American colony, from the very beginning of settlement, iron was essential for the tools of agriculture and many crafts. Common tools which are today made of steel were then made of iron, or of wood and iron. Iron was essential for colonial shipbuilding, building construction, and weapons manufacture, in addition to agriculture. Iron-making was one of the first industries undertaken by the European settlers in America, and one of the few major colonial economic activities not directly linked with either agriculture or the sea.

In the mid-Atlantic colonies, iron ranked in economic importance just beneath tobacco and grain production. During the 18th century, it became a major trade item. Many colonial men gained wealth in trade or money-lending or the professions, but under Britain's long-standing mercantile philosophy, the basic commodities from the colonies were of first importance, and iron was, after such items as tobacco and rice, a major commercial item. In some American colonies iron-making, like tobacco-growing, brought about peculiar economic and social structures, which varied from colony to colony. It generated the first forms of American industrial organization--forms which persisted as long as iron was smelted with charcoal fuel. Thus iron-making is worth examination as an early American pattern of marshalled resources, capital and labor.

A social organization was also generated by the colonial iron industry of the mid-Atlantic area, which bore some

resemblance to English iron enterprises, to Colonial tobacco plantations, and to later "company towns." It was a form of organization which reflected, among other things, the varying patterns of land acquisition and land use in the colonies of New Jersey, Pennsylvania, Maryland, and Virginia. The social organization reflected some of the physical and geographical requisites for iron-making, including transportation for heavy raw materials and finished products; disciplined and skilled non-agricultural labor, plus unskilled labor; access to ample supplies of iron ore, timber for charcoal, lime for flux, and running water for power. Much is now known about the social structure of tide-water agriculture, but there is little information on record concerning social structure and quality of life associated with the area's early industry.

Process

Economic and social aspects of the early iron industry cannot be understood without some grasp of iron-making technology. The technology presupposes certain conditions which must be met by any successful iron enterprise. In Maryland, as in the rest of the colonies, it was essentially a borrowed technology. American ironmasters usually employed the "English" or indirect process rather than the "German" or direct process of iron manufacture. The former was more expensive since it involved two facilities and two stages of operation: a furnace to smelt the ore and a forge to refine the crude pig iron. It had the advantages of being better suited to large volume production and resulted in a higher quality final product.

Before iron can be put tc use, it must be smelted; the iron ore (which is found with a substantial percentage of non-iron impurities) must be raised to a temperature at which it melts and impurities and the pure iron separate. For most iron ores, this calls for only a moderately high, sustained temperature, one attainable even by some primitive methods. Small quantities of iron can be smelted directly on a domestic-scale hearth, much like those once used by blacksmiths. Ordinary charcoal is a suitable fuel, and with a blowing device--a bellows--it produces sufficient heat. The ore must be heated in the presence of a flux, a chemical which promotes coagulation of the ore's non-metallic impurities. Lime is the usual flux for iron smelting. A small scale charcoal hearth such as is described above, was used for centuries in many parts of the world for the direct process of iron smelting. In Great Britain and the Colonies, this device was termed a bloomery forge. Bloomery forges were used to produce the first iron in North America and they continued, in local use, during the colonial years.

For larger scale iron production, the blast furnaces was in common use in England and Europe during the time of North American colonization. With the blast furnace, iron was produced in commercial quantities on a continuous basis, unlike the bloomery forge which smelted iron in only one lump at a time. The usual English furnace of the period 1600 to 1800 was a brick or stone pyramid, hollow down the center with holes at the base and an opening at the top. It was generally square at the base, measuring about twenty-five feet to a side and rising to a height

of about thirty feet. The hollow in the center was shaped like a lantern glass and was generally about eight feet in diameter at the widest part--called the "bosh." The furnace was loaded or "charged" with iron ore charcoal, and lime through the opening in the top, which also served as the chimney. To sustain sufficiently high temperatures, the blast furnace needed a power-driven air pump or blowing device. Iron furnaces were located near running water, which was dammed and directed to a simple wooden water-wheel, the same type used to power the more common grist mill. The water-wheel worked a leather and wood bellows, rather like an oversize fireplace bellows.

Iron furnaces consumed large amounts of raw material. The average blast furnace used three tons of iron ore and about 300 bushels of charcoal every 24 hours, as long as it was operating. When a sufficient quantity of raw materials was assembled, the furnace was put in blast. Once fired, it was periodically charged from the top with measured quantities of alternating layers of ore, flux and charcoal. Air was pumped into the stack through the hole at the bottom of the tuyere--to raise the temperature of the burning charcoal. Periodically, the higher of the two taps was opened and the slag--a molten glass-like waste material--was drawn off and discarded. Then two or three times every 24 hours, the lower tap was opened and the iron run out. Usually it was poured directly or ladled into molds to make such objects as cast iron kettles, or it was run into a series of short channels grooved into the sand on the casting-house floor. Some centuries ago, it was evidently noted that the main pouring channel and the

row of smaller grooves resembled the outline of a sow with suckling pigs; hence, the term "pig iron."

To be refined, the pig iron was taken to a forge where it was again heated to a plastic state and then pounded by a large, water-powered hammer. Reheating and pounding removed additional impurities and strengthened the metal by realigning its molecular structure into a lengthwise, fibrous pattern. The reheating and pounding was repeated several times, and the result was a metal more malleable and less brittle than plain cast iron. Drawn out and cut into bars of convenient size, the iron was then ready to be worked, by blacksmith or machine, into a variety of useful items. This outline process was brought to the colonies from a long-established English iron industry. (There were some Colonial ironmasters who came from other European countries.) The conditions which this basic process imposed include access to sources of iron ore, lime, and to substantial timber. The process demanded sufficient capital to erect a furnace, forge and water-power devices and to secure a stock of raw material sufficient to keep a furnace in blast for some months. Other conditions include a pool of skilled labor and access to transportation for the large quantities of heavy raw materials and finished products.

Maryland

Resources and geography made it possible to set up iron manufacture in many of the North American colonies, including Maryland. Much of the reason for an iron industry in Maryland, however, is to be found in the economic policies of England.

Since mid-seventeenth century, it had been the avowed policy of England to exploit economically the resources and advantages of its colonies. Under what later came to be called the "mercantile" theory, the very purpose of the colonies was to increase the wealth of the mother country. The colonies were to furnish England with those materials which England either needed and consumed, or could exchange with other European countries to attain a favorable balance of trade. In return, England provided all kinds of manufactured items, including tools and furnishings. The American colonies were the chief market for England's manufactured goods. It was part of the mercantile idea that all this trade ought to be conducted in English (including Colonial) ships through English ports and, most important, that no manufacturing be permitted in the colonies. Altogether, the purpose was for England to realize the maximum economic advantage from its Colonial holdings.

With iron, the mercantile system worked as follows: Prior to the colonization of North America, England had a strong secondary metal-working industry which, by the start of the 18th century, could no longer be adequately supplied by England's own iron furnaces. By 1720, England was producing only 18,000 tons of pig iron per year, and was importing over 20,000 tons, mostly from Sweden. England's chronic shortage of pig iron threatened its secondary metal trades, which produced valuable export items. But England's own iron-smelting industry was stagnated for want of fuel. Forests all over Great Britain were believed to be disappearing and iron-making, with its appetite for charcoal,

was considered a major cause. The fuel situation was considered so critical that, instead of expanding to meet a growing need for iron, many furnaces were shutting down for want of charcoal. After 1609 it was known in England that iron ore was to be found near water in North America, because in that year Captain John Smith shipped to England a small quantity of ore which he secured in the Chesapeake Bay area. Possibly it was taken from the vicinity of the Patapsco River, which Smith named Bolus River on his map, allegedly because the red color reminded him of Bole Armoniack. Iron-making in the colonies, however, first got underway at the Saugus works in Massachusetts, in 1646.

In Maryland, iron-making apparently began in 1718. In that year, three tons of bar iron was shipped to England from the Chesapeake Bay area. It was probably the product of a small bloomery forge and may well have come from the "ironworks" mentioned in records of a 1716 transaction between Richard Bennett and Robert Dutton, concerning land and facilities on the North East River. The iron industry began in colonial Maryland with the forming of the Principio Company in 1720. At about that time, some local legislation indicated that the development of an iron industry was a matter of public concern in Maryland. In 1719, the Maryland General Assembly passed what it called "An Act for the encouragement of an iron manufacture within this province:

> Whereas, it is represented to this present General Assembly that there are very great conveniences of carrying on Iron Works within this Province which have not hitherto been embraced for want of proper encouragement to some first undertakers, although the consequences thereof might not only be considerably advantageous to the persons immediately concerned therewith, but also to the public trade of Great

> Britain and this Province, therefore be it Enacted that if any person or persons shall desire to set up a forging mill or other conveniences for carrying on Iron Works on lands not before cultivated adjoining a stream, he may get a writ ad quod damnum.* On the return of this, if the owner refuses to build such mill and gives securities to complete it within four years, the governor may grant one hundred acres, the owner being paid for it. Grantee is to give land to begin the mill within six months and finish it in four years. Workmen at the mill, not exceeding eighty are to be levy free. If pig iron is not run in seven years, the grant is void.

A follow-up Act of 1721 exempted workmen at furnaces, forges and mills from labor on the highways. Such legislation demonstrates a public awareness of the needs and advantages of iron works, and it is a matter of record that under the 1719 Act, no fewer than 23 writs were granted between 1733 and 1767, most of which did result in iron works being erected.

The Maryland iron industry grew up with a market available in England. But many colonial ironworks chose to sell their output in the colonies. There were a number of factors that vitiated the attractiveness of the English market: the hazards, slowness and seasonal nature of the trans-Atlantic shipping; the numerous freight and handling charges which cut into profits; the uncertainty of dealing with strangers and distant markets; and fluctuations in value of sterling and colonial currencies, to name only a few. In the colonies, there was a regular and growing demand for iron, especially a local demand for bar iron,

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*A writ ad quod damnum was a condemnation procedure whereby a water-power site could be acquired in Maryland by having it surveyed (100 acres for a "forge mill" and other ironworks, and 20 acres for all other water mills, including gristmills), and securing a deposition by 12 local men that use of the site would cause no harm or damage. The Land Office then granted a patent on the land.

and the number of colonial ironworks grew throughout the 18th century. In Maryland, for instance, those few furnaces reported to have gone out of business before the Revolutionary War are reported to have done so because of technical mishap or poor quality of the local ore.

The Maryland iron industry developed in a geographical context in which water transportation was ample. Nearly all furnaces and forges set up prior to the Revolutionary War were within a few miles of the Chesapeake Bay or its many rivers then navigable for ocean-going ships. In an era not celebrated for good roads, the Chesapeake may have provided Maryland and Virginia with a solid advantage over the other colonies, in the development of ironworks. Most of Maryland's best iron ore was also located quite close to navigable water, especially the deposits along the Patapsco River at what is now Baltimore Harbor. Timber suitable for charcoal fuel was also present in ample quantities; there is no indication of fuel supplies running short during the colonial era. The major source of lime for flux, during this era, was oyster shells from Chesapeake Bay.

Growth

A Council Proceedings Report to the British Commission of Trade and Plantations dated August 23, 1756, stated that there were eight furnaces and nine forges in operation in Maryland. Most sources of data agree that 15 to 20 furnaces and a like number of forges had been constructed in Maryland by the time of the Revolution. The Maryland iron enterprises set up prior to 1776 were:

FURNACES	FORGES
Principio	Principio
Kingsbury	North East
Lancashire	Baltimore/Gwynn's Falls
Baltimore/Gwynn's Falls	Baltimore/Mount Royal
Baltimore/Charles Run	Onion's Gunpowder No. 1
Onion's Gunpowder River	Onion's Gunpowder No. 2
Snowden's Patuxent	Snowden's Patuxent
Nottingham	Ridgely's Long Calm No. 1
Ridgely's Northampton	Ridgely's Long Calm No. 2
Dorsey's Elk-Ridge	Unicorn
Dorsey's Curtis Creek	Elk
Bush River	Hockley
Legh	Rock
Antietam	Cumberland
Mount Etna	Antietam/Potomac River
Mount Etna/Leitersburg	Rock/Great Rock
Green Spring	Hughes'/Antietam Creek
Catoctin	Jacques'/Licking Creek

Products

The furnaces produced pig iron and large cast objects. The forges turned out bar iron, which is a purer and more easily wrought product than pig iron. Because of the design of the furnaces, and the contemporary iron-making procedures, it is probable that the cast iron and pig iron of the colonial era were far cruder materials than what we in the 20th century associate with the term "cast iron." The 18th century variety

must have had very high slag content, and without further refining, it could have been used only for rather rough castings.

Items cast directly at the furnace included firebacks--large flat pieces of iron which were placed at the rear of a fireplace to hold and reflect the heat; heavy implements for forges, including hammers and anvils; stove plates, weights, salt pans. Other simple items were cast directly, utilizing molding sand and wood patterns. Such efforts resulted in what was generally termed "hollow ware" and included pots, pans, skillets, sugar kettles, and Dutch ovens.

Probably the largest items cast by Maryland furnaces were cannons. In the 18th century, cannon and shot were still produced by direct casting of iron. They had been the principal product of the English charcoal iron industry as far back as the mid-16th century. It is widely rumored that cannon and ammunition for the Revolutionary War were produced at nearly every ironworks in Maryland. However, documentary evidence so far indicates that cannon casting took place only at Antietam Furnace, Elk-Ridge Furnace, Northampton Furnace, Mount Etna Furnace and the Baltimore Iron Works. Others, including Catoctin Furnace produced ammunition.

Most of the furnace production went into pigs which were then converted to bar iron, mostly for local use. It was bar iron which was then wrought into the great variety of colonial necessities: nails, axes, shovels, scythes, hoes, chain, tire iron; hardware for other trades, including milling, shipbuilding, blacksmithing, coopering, lumbering; and domestic fittings, including hinges, bolts, straps, tie rods, and cooking utensils.

The Maryland iron industry played an important part in the Revolutionary War, both in production of hardware and provision of leadership: many Maryland iron men were directly involved on the Patriot side of the military and political struggle, including members of the Johnson, Ridgely, Carroll, Hughes, Dorsey and Snowden families.

When the War ended, the Maryland industry--having suffered scant damage--was able to shift to production of peacetime items, and was free to manufacture all kinds of finished iron products. Technologically, there were few changes in the industry until the 1830-1860 period, when experiments were conducted with anthracite and coke fuels, with steam power for blowing engines, and with hot blast smelting. Some Maryland ironworks were in the forefront of technological innovations: the first T-rail (for railroad track) produced in the United States was rolled in the Mount Savage Iron Works of Allegany County, in 1844 (the National Museum of History & Technology, Washington, D.C., has a section of Mount Savage rail on display).

The first commercially-successful use in America of coke fuel took place at Lonaconing Furnace, a steam-powered hot blast facility built in 1837 near Frostburg. For the most part, England's iron industry continued to be decades ahead of the United States iron industry, technologically, and enjoyed a strong edge in world iron marketing. Many of America's first locomotives rolled on English-made rails, for instance.

Still, the years leading up to the Civil War saw a booming demand for iron which benefitted existing furnaces and caused many new ones to be built in Maryland. During the 19th century,

Maryland's iron industry was concentrated in the Baltimore area. Iron was needed for finished goods, but was especially in demand for cast iron plows, for stoves, for steam engine parts, and most of all for use in railroad track and rolling stock. Ironically, while the railroads were a good customer--many Maryland charcoal furnaces concentrated on producing car wheel iron--it was the railroads' opening of national markets and the linking of such resources as the Great Lakes ore ranges with such production centers as Pittsburgh, that eventually ended most of Maryland's iron industry.

Interpretive potential

There are many early industrial sites in Maryland, many places where iron was manufactured in the 18th- and 19th centuries. The sites discussed below--Principio, Gunpowder, Nassawango, Antietam, Catoctin--are the most complete and offer the best possibilities for interpretation of this important Colonial Maryland industry.

Some industrial sites which were important are now obliterated by new pavement or the waters of a reservoir, or have completely disappeared. Others are inaccessible or lack information or surviving artifacts. For many locations of historical interest, it is probably enough to provide the interested public with a marker, reminding them of history and location, e.g. the Curtis Creek Furnace in Anne Arundel County.

But some sites, taken as a State-wide unity, offer an opportunity to present a complete chapter of Maryland's past. There is ample evidence that Principio, Gunpowder, Nassawango,

Antietam and Catoctin are all important parts of Maryland's early iron industry, each having a distinct and appealing history. Each site still contains artifacts and structures of visual interest and genuine historical significance; each site is at once well-preserved (and hence would be an appropriate and rewarding field for acheological research), and yet could be made readily accessible to the public; each site is conveniently located near normal tourist traffic, and near other recreational lands and attractions.

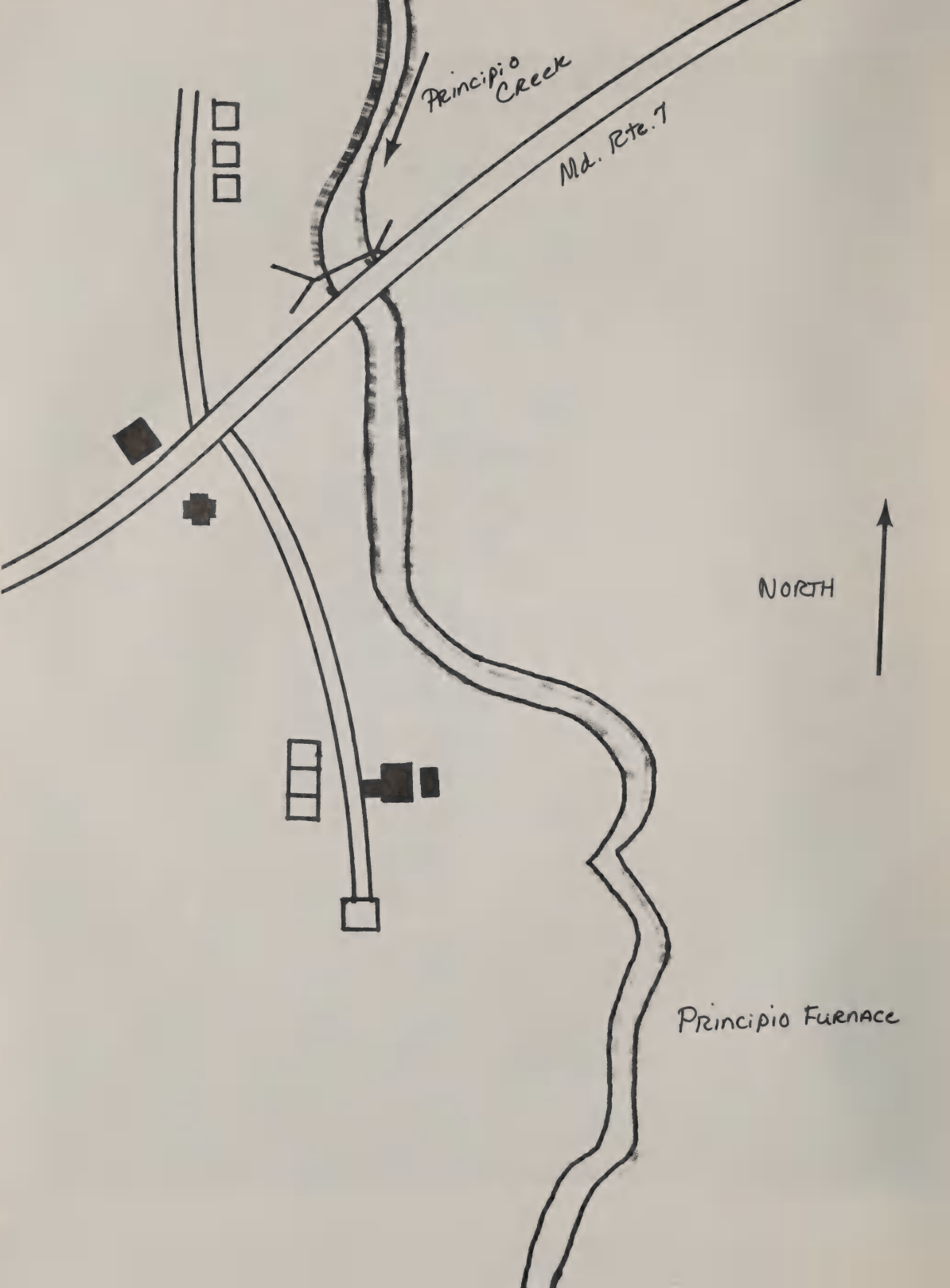
FURNACE STACK AND MACHINERY AT PRINCIPIO FURNACE

Remains

Iron was produced and worked between 1725 and 1891 along the banks of Principio Creek in Cecil County. Remains above ground are confined to the area along either side of Principio Creek and between U.S. 40 and Chesapeake Bay.

There is a dam crossing the creek, just north of Maryland Route 7, along with remains of a head race and water control gate. A stone furnace stack, largely intact, is located a quarter-mile downstream from Route 7, and within a quarter-mile of the present course of the creek. This furnace is probably the stack erected in 1837 by George P. Whitaker and company. It is 28 feet square at the base and about 30 feet high, braced with iron tie rods and about 9 feet in diameter at the boshes. There are three tuyere openings at the base, plus a casting opening on the northeast side. It is a water-powered hot blast furnace and the water turbine, blowing engine, power transmission gear and hot air oven are essentially intact.

The hot air oven is located a few feet east of the furnace stack. It is built of brick and rubble masonry reinforced with iron rods and angles. Iron tubes, much like boiler tubes, remain in upright loops within the brick walls. Additional iron tubing, 9 inches in diameter (used to convey heated air to the furnace stack via the blowing engine), remain in place between the hot air oven and the furnace, and in the three tuyeres of the stack. The horizontal blowing engine is nearly complete. It consists of one pair of iron plate cylinders, with pistons


Principio Creek
Md. Rte. 7
NORTH
Principio Furnace

driven by connecting rods which are attached to a crankshaft. Power was supplied to the crankshaft via spur gears and was developed by a water turbine, which is still installed and appears to be complete. The blowing engine once had a cylindrical balance tank mounted on top of the two cylinders, to smooth out the impulses; it is no longer in place, but has fallen to one side of the engine.

The turbine is installed in what appears to be a wheel pit, suggesting that the furnace was once blown by an overshot water wheel. The building materials also suggest that the hot air oven is of a later date than the furnace and hence that the furnace was originally a cold blast type which was later converted to hot blast. (A photograph of an undated print in the HABS file supports this view: it shows a furnace stack on the same location as the existing one, closely resembling the existing one, but without the hot air oven and pipes.)

West of the furnace and across a roadway, there is a collapsed wooden shed, probably the remains of a charcoal or iron ore house. Farther south along the same roadway (along the west bank of Principio Creek), there are additional wooden sheds and larger brick buildings, all likely of 1850-1900 date of construction, and all appearing to have had some industrial function. One large brick building appears to have been a machine shop. Others were probably shops or storage sheds. There is also a barn, and a circular brick oven-like structure, apparently designed as a charcoal-preparation facility.

Along Route 7 and just south of the dam, there are several

additional sheds and an office of the Whitaker Iron Company. Across Route 7 to the north, there are several foundations, which are remains of workers housing constructed ca. 1900 and the Whitaker house (built in 1837), currently occupied by the caretaker of the property.

Summary: major above-ground remains at Principio Furnace

One furnace stack

One hot air oven

One water turbine

One horizontal blowing engine

One dam

Numerous wood and brick buildings

Numerous stone building foundations.

History

The Principio Company was formed in England by a group of well-to-do ironmasters and merchants, including: Sir Nicholas Hackell Carew; Thomas Russell and his sons William and Thomas; John England; John Ruston; Stephen Onion; Joshua, Osgood, and Samuel Gee; William Chetwynd; and Joseph Farmer. Their avowed purpose was to smelt iron in the Chesapeake Bay area and to supply themselves, and to sell the iron in England. After successful early exploration of the iron-making possibilities in Maryland and a start in acquiring the necessary land, the Company sent John England over to set up a furnace and forge. He arrived at the Principio Creek location in 1723 and began his work. Thereafter, all Principio Company iron-making operations were administered in America by resident ironmasters and managers.

During its six decades of operation, the Company was administered in Maryland and Virginia by Stephen Onion (1720-1723); John England (1723-1734); John Ruston (1734-1736); Nathaniel Chapman (1736-1761); William Baxter, Nathaniel Martin and others (1761-1764); Thomas Russell II (1764-1769 and 1771-1781).

John England's major challenge was one of pioneering, of finding ways to produce iron where there was no precedent. He had to create his own sources of supply and labor, develop lines of communication and build a physical plant of some complexity. By 1725, England had completed the construction of the ironworks on Principio Creek, including a dam, race, water-power machinery, bellows, forge and furnace stacks. By the same year, the Company had reached an agreement with Captain Augustine Washington, to develop an ironworks on Washington's land at Accokeek, Stafford County, Virginia. Washington became a share-holder in the Principio Company, and during 1726 and 1727, John England supervised the construction of an ironworks at Accokeek, including the usual dam and water-power gear, plus a furnace and a mill. Construction at Accokeek did not mean operational stagnation at Principio, where pigs and castings were being produced and shipped by 1728. John England supervised the development of the company's two furnaces and its forge, and marketed the iron products until the time of his death in 1734.

The man who took over from John Ruston in 1736 was Nathaniel Chapman. He was the next major ironmaster in Principio Company history and was perhaps its most important figure; he was with the Company in some managerial capacity

from about 1728 until his death in 1761. When Chapman took control in 1736, the Company had, on the Washington family land at Accokeek, at least one iron mine, one furnace, a store, a grist mill, a stable and a plantation. At North East, the Company operated a plantation and North East Forge. At Principio, the Company had a furnace, a forge with two fineries and one chafery, a store, a grist mill, and a blacksmith shop. In addition, they held much land in Cecil and Baltimore counties, including some very productive iron mines on the Patapsco River. They also operated several sloops for transporting raw materials and finished products. The Company had an ample labor force at each installation, and was producing and shipping pig iron, blooms, bar iron and castings. The quantity of iron which was shipped to England from Maryland and Virginia in 1736 was 2,458 tons of pig iron, or nearly ninety per cent of the total shipped to the mother country from the colonies. While it is not known what percentage of the total actually came from Principio Company enterprises, it is known that both Company furnaces were capable of producing twenty tons of pig iron per week each, so could have produced as much as one-third of the year's total.

The most important activity of the Principio Company in America, during Chapman's years as ironmaster was the shutting down of the Principio and Accokeek furnaces in the 1750's, and the acquisition by purchase and construction of two new furnaces, Lancashire and Kingsbury. After 1727, most of the Company's iron ore was being transported by water from the Whetstone Point mines on the Patapsco River. The freight charges at

4s 6d per ton were worrisome to the partners and when, in 1734, the Company finally acquired property in Baltimore which included a likely furnace site, Chapman was urged by the partners in England to explore the possibilities. Accordingly, Chapman investigated the matter and found the situation favorable for erection of a new furnace. What had been purchased in 1734 was a tract of land known as the Kingsbury Lands. It totaled 1,382 acres and was located along the Back River at Herring Run. Although the furnace site was not finally patented until 1750, the furnace was erected by 1744, and according to surviving Company account books, was in operation and producing castings by 1745. Kingsbury furnace seems to have been started making smaller items than had been produced at the Company's other works. A 1745 account book mentions cart boxes, potts, small potts, doggs and skellets, [sic]. Kingsbury must be counted a success, producing not only a variety of castings, but during the 1740's, about 14 tons of pig iron per week, and continued in production during the remainder of the colonial years.

The next--and last--expansion of the Principio Company also took place under Nathaniel Chapman's management. Lancashire Furnace was purchased on September 4, 1751, for £2675. The site of Lancashire Furnace, on the west side of North East Creek, within two miles of Kingsbury Furnace, had been patented in 1744 by Dr. Charles Carroll, one of the original partners of the Baltimore Iron Works. Principio's purchase was likely a response to their success with Kingsbury, which was then producing well and which, by its location, eliminated the costs of a

50-mile boat trip for their iron ore. Lancashire Furnace ran steadily from the time of its acquisition through the 1750's and 1760's to the Revolutionary War.

The above-described acquisition, however, does not mean that the Principio Company operated four furnaces simultaneously for any length of time. Rather, the smelting operations were moved closer to the sources of ore. Chapman supervised not only the establishment of two new furnaces for the Principio Company, but also the shutting down of two old ones. Accokeek was the first to go. It produced well for several decades but was shut down during the mid-1750's, after Kingsbury and Lancashire were both operating. Precisely why it was shut down is not explained in Company papers now available. It does not appear that the ore in the area gave out, (although Lord Fairfax's decision to reserve to himself one-third of all the iron ore in the Northern Neck of Virginia may have been a factor,) since several other furnaces nearby continued to operate.

In any case, the Accokeek works shut down around 1755. What is more surprising is the apparent demise of the furnace on Principio Creek. The Company's own account books, and the inventory of confiscated British property conducted in 1781 by Maryland state agents suggest that smelting of iron ore had stopped at the Principio Furnace. The last Company account that specifically mentions "Principio Furnace" is dated 1753. The State inventory of 1781, detailed as it is, does not refer to a furnace at Principio. Shutting down the furnace was probably a matter of expense. With furnaces at two locations

and forges at the head of Chesapeake Bay, the Company's vessels would have had to carry both ore and pigs up the Bay and both pigs and bars down the Bay to be marketed. Another factor is suggested in a 1758 letter to Nathaniel Chapman from the partners in London: the iron market is described as being "very variable" and it is suggested that they might wish to de-emphasize the manufacture of pig iron for the English market.

The third major figure to operate the Principio Company works was Thomas Russell II, who took over after Nathaniel Chapman's death in 1761. Russell came to America from England specifically to run the Principio ironworks and, soon after his arrival, he had the works operating briskly. Account books for the late 1760's show both Kingsbury and Lancashire furnaces regularly in blast for six to eight months at a time, and the Company's sloop and schooner regularly carrying loads of pig iron to Virginia and Maryland ports for shipment and sale. Accounts for the last quarter of 1769, for instance, show that the Principio Company sold over 20 tons of pig iron in Liverpool, over 65 tons of pig iron in Bristol, over 46 tons in London, and over 51 tons of bar iron in London, and also distributed nearly £1,000 to the share-holding English partners.

When the Revolution broke out, the Company lost everything, although Thomas Russell II, suffered no personal defeat. When the war began, he was in Maryland, operating the Principio enterprises and he remained there throughout the conflict, keeping the works in operation. Russell and a number of other important men in the Principio enterprises signed the oath of

allegiance to the State of Maryland in the spring of 1778. In 1780, the Maryland General Assembly passed a law to confiscate all British property within the State. Two ironworks owned in part by loyalists--Elk Forge in Cecil County and the Nottingham Company in Baltimore County--were seized under this law. Of course, the Principio Company, with predominantly British ownership, was also seized, in 1781. Since Russell was a loyal citizen of Maryland, his property could not be seized (neither should the Washington family share have been seized, but the Washingtons were compensated by the State of Maryland only after years of litigation) and, in fact, Russell was appointed caretaker of the Principio holdings. Sales of the confiscated property in Baltimore County began in 1781, but Russell was the beneficiary of a special Act of Partition passed by the General Assembly of Maryland in April, 1782, under which he was awarded the North East Forge, "and such of the Lands, Negroes, Stock and utensils to the same appertaining as the said Thomas Russell might think necessary for carrying on the said Forge." Included was a total of 6,393 acres of land in Cecil County. A Commission consisting of Archibald Job, Thomas May (former ironmaster at Elk Forge), and Stephen Hyland, in October 1782 evaluated the total property at £5,550 7s 6d current money of Maryland. This property was then turned over to Thomas Russell II, who operated the North East Forge until his death on May 5, 1786. The remaining Principio Company was auctioned during the 1780's for a total of over £90,000. The furnaces in Baltimore County apparently were never again in use.

After Russell's death, the Principio Creek location was next activated in 1790, by Colonel Samuel Hughes, who had moved to Harford County and set up several iron-making ventures in Cecil County. Hughes became a partner with John Churchman in a forge on Octorora Creek (later known as Frey's Forge); Hughes' chief interest was in developing Cecil Furnace--an iron smelter and cannon factory which he set up along the banks of Principio Creek, on the old Principio Furnace property. He built a new charcoal furnace and other facilities including a cannon-boring mill. In 1796, Hughes secured a contract with the United States government to produce cannon for new frigates at his new works. The agreement specified that Hughes was to manufacture 24 nine-pounders; 12 six-pounders; and 40 twelve-pounders, all at a rate of $133.25 per ton.

Hughes' iron operations in Cecil County were generally successful, although he suffered a major setback during the War of 1812. Admiral Cockburn brought a fleet up the Bay, attacked the Cecil Furnace and burned the buildings and facilities, and destroyed the cannon on hand. Hughes then rebuilt his works, but it was such a financial strain that his business was never again healthy. He mortgaged and then sold the Cecil Furnace to Baltimore merchants Robert Gilmor and Robert Smith. When Hughes advertised the works for sale, it was still equipped for the cannon manufacture which had been the mainstay of Hughes' career in the Maryland iron industry: "The Cecil Works . . . consisting of one blast furnace, two air furnaces, a Boring mill with the most perfect machinery to bore five Canon at a time, a stamping mill, a Stone grist mill, managers and workmen's

houses, Coal House, Stables and Smith's shop, with Iron flasks, tools and machinery necessary for making Canon . . ."

Messrs. Smith and Gilmor retained the works until 1834 when it was purchased by David Stewart and partners, who re-sold it in 1836 to members of the Whitaker and Garrett families. These men modernized the works and put it into operation with a new charcoal furnace, 32 feet high and 8 1/2 feet in diameter at the boshes. Sometime between 1837 and 1856, this furnace was converted to hot-blast operation. Capable of producing 800 tons of pig iron in 37 weeks, this furnace continued in operation until 1889. Whitaker Iron Co. then owned and operated the works and continued to add facilities and make improvements up to the turn of the century, although pig iron was last manufactured at Principio in 1891. The entire property is still owned by the Whitaker family, now of Wheeling, West Virginia.

Interpretive potential

The Principio Furnace site is the most important of the five ironworks sites, from the standpoint of historical significance and availability of information. Thus it has the greatest potential for fruitful interpretation. It is the site of Maryland's first iron furnace, and was its first industrial enterprise. Principio Furnace was a success during and after the colonial years and had a unique span of productivity for a Maryland industry--from early 18th century to early 20th century. Principio may well have produced supplies for the Continental military forces; it is probable that most of the cannons for the United States Frigate Constellation (now in Baltimore harbor)

were manufactured on this site. The many changes in ownership and developments in iron-making facilities here during the whole of the 19th century suggest in capsule, an important technological and social story--part of the development of industrial America.

The accompanying bibliography suggests the extent of the information available on the Principio enterprise. The collection of Company records in the Historical Society of Delaware, while it is not presently organized or catalogued for convenient research, is a unique historical resource. These records can provide data on virtually every aspect of the Principio operation, including such matters of general interest as how many workers were employed, what kinds of work they performed, how they were paid, where and how they lived, what they wore and what they ate. This type of information is difficult to come by, and there is not much of it in print.

In addition, the records in Delaware and the other scattered sources offer a wealth of detail on securing ore, charcoal and flux; the construction and repair of the works on Principio Creek (as well as the other Company installations--Kingsbury, Lancashire, Accokeek); the day-to-day smelting operations; the Company's business organization and methods; marketing iron products in both North America and Great Britain.

In listing sources of information, the Principio Furnace site itself ought not be overlooked. Since the construction of Maryland's first blast furnace down to the present day, the Principio Creek site has remained intact and has undergone no development which was not related to iron-making. It is

the oldest undisturbed, undeveloped industrial site in the State and as such probably contains historical artifacts and remains enough to portray, unbroken, the entire development of iron-making in America. Of course, only archeological investigation could verify the survival of evidence from the various earlier enterprises. As it now exists the Principio site is a unique field for research, especially in 18th century iron-making.

The above-ground remains on the site all date from the 19th century, but some--especially the hot-air stove and the water-powered blowing engine--are practically unique survivals. The remains are extensive and, even in their present state of neglect, illustrate many aspects of charcoal iron technology.

Altogether, the long history, the information available--both on site and on paper--and the proximity to major tourist approaches to Maryland suggest that if a Bicentennial "Iron Trail" project is to materialize, Principio is the logical place for its interpretive headquarters. Principio Furnace has the greatest interpretive potential of any iron site in Maryland.

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FURNACE STACK AT GUNPOWDER FURNACE

Remains

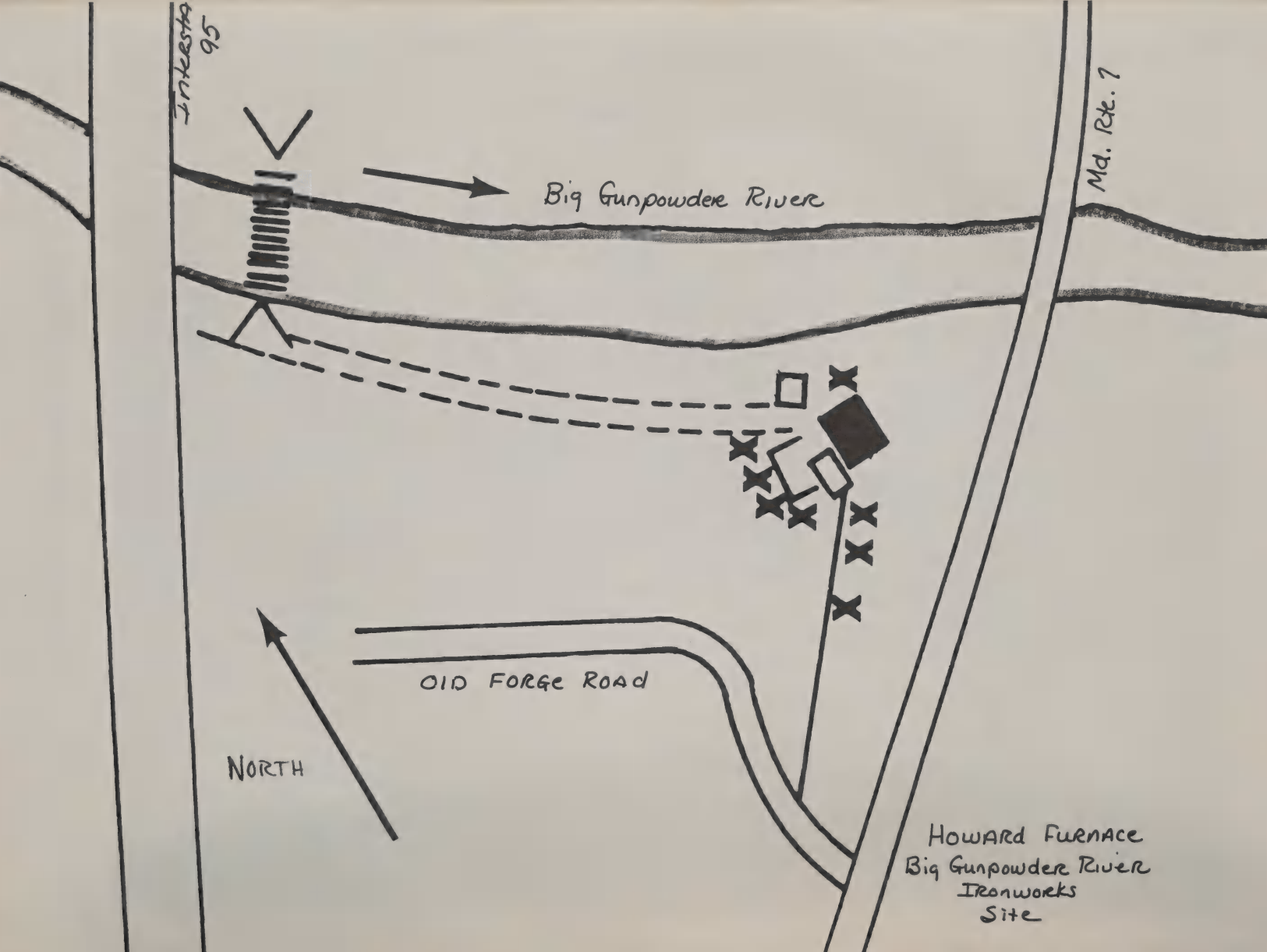
The Gunpowder River area differs from the others described in this report in that several different ironworks were developed and operated by different companies over a long period of time. Furnaces, forges, and iron finishing works were scattered over a larger area than were any of the ironworks described elsewhere.

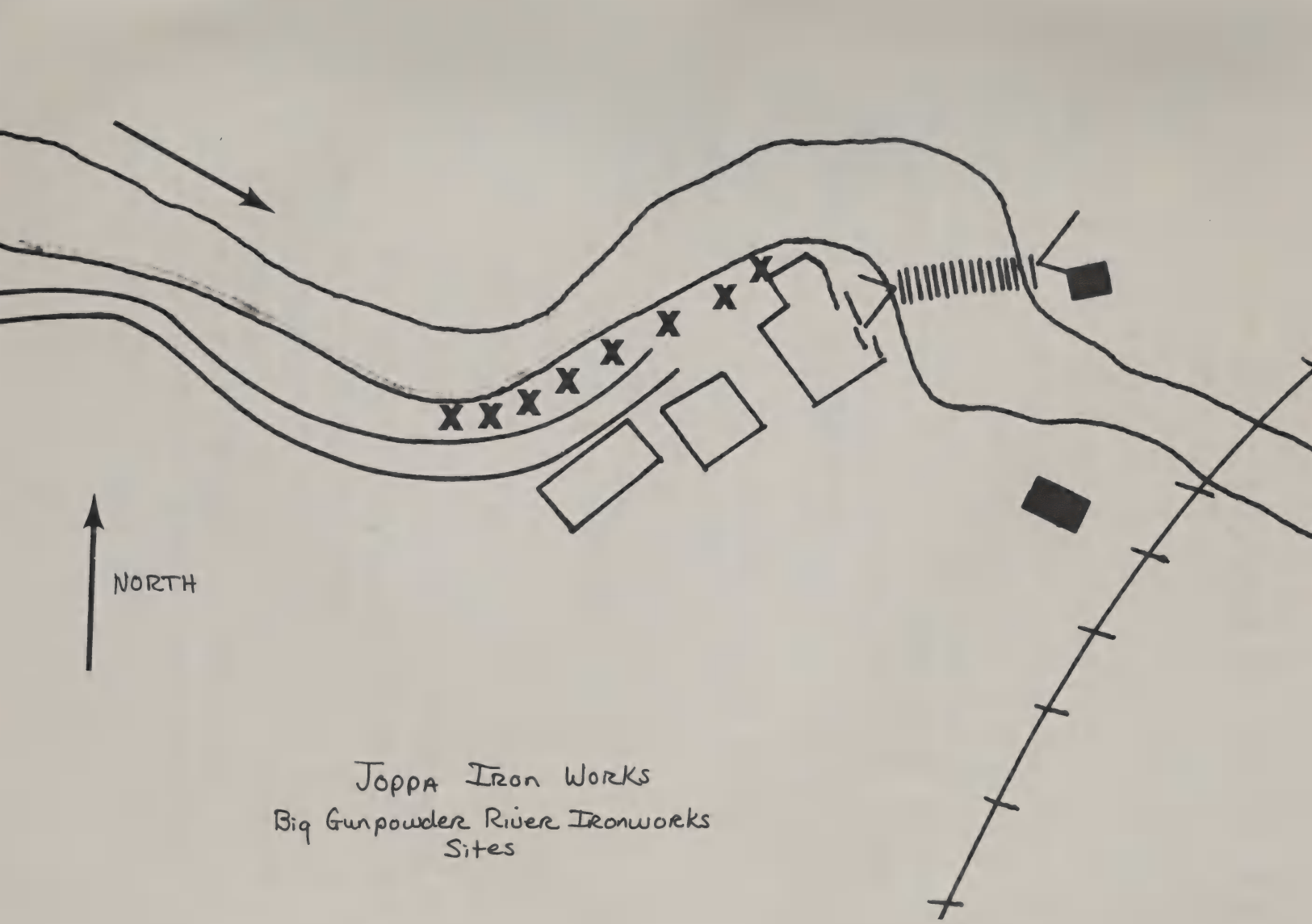
For convenience and clarity, remains are described under the headings of Big or Little Gunpowder River' Works were actually distributed along the banks of both the Little Falls and the Great Falls of the Gunpowder. In each case, ironworks were located between Chesapeake Bay and the head of navigation of each stream, which in the 18th century was considerably farther upstream than it is today; both rivers have silted up heavily since colonial times.

LITTLE GUNPOWDER: Structural remains of any kind, are sparse. The lone major iron operation on this stream was the 18th century Onion Ironworks, reportedly located just downstream from the crossing of the old Philadelphia Road, currently termed Maryland route 7.

In the stones of the river bed and banks no more than 75 feet below the current bridge, there is a series of bored holes, one to one and a quarter inch in diameter, traversing the stream in a line perpendicular to its flow. These are likely the site of a dam.

A portion of the north river bank is formed by a low wall, fitted together of small stones. No cement was used. This


Interstate 95
Big Gunpowder River
Md. Rte. 7
OLD FORGE ROAD
NORTH
HOWARD FURNACE
Big Gunpowder River
Ironworks
Site



Joppa Iron Works

Big Gunpowder River Ironworks
Sites

structure may be the foundation of a small building, or a portion of one end of a dam. Downstream from this conjectured foundation, and only a few feet from the north river bank, there is an outcropping of large cut stone, probably a building foundation. Silt and heavy undergrowth along the north bank make it difficult to determine the extent or outlines of a foundation, although this is precisely the area where the Onion works was reportedly located.

There is another cut stone foundation of a building, just downstream from the above. It appears to have been located directly adjacent to the river. The foundation is about two feet thick and the side parallel to the river flow is partially submerged and partially forms the bank of the river. Perpendicular walls appear as stone outcrops on the river bank. There is no direct evidence dating any of the above, or linking it firmly to the iron industry. All remains, however, are within the area described in a sales advertisement for the Onion Ironworks, in the 1769 Maryland Gazette.

About 75 yards upstream from Route 7, there is a small falls, with a rocky river bed that surely blocked all navigation. At this point, traversing the river, is a series--at least six are visible--of bore holes in the fixed stone. The holes are about one inch in diameter, and two of them still contain imbedded sections of iron rod. Again, this is likely a dam site.

BIG GUNPOWDER: Both banks show industrial remains in the area from the mouth of the river to above the current Interstate-95 highway bridge. Just above the Baltimore & Ohio Railroad crossing, about 30 feet from the current south bank, there is a small brick and iron heating furnace, measuring eleven feet, three inches long; six feet wide, and five feet high; and partially collapsed

at the rear, chimney end. Along with scattered lumps and outcrops of stone, concrete and structural iron, this small furnace is likely a survival of the several iron finishing works, including nail mills, reportedly located in this vicinity during the 19th century. It may have been part of the Joppa Iron Works.

Just upstream from this furnace is a large area paved with concrete, which is apparently foundation remains of a half dozen large industrial buildings that were demolished since 1951. Adjacent to this paved area, along a south bank covered with a slag-like, metallic industrial waste substance, there are substantial remains of a dam and a water-intake structure, both made of concrete and largely intact.

Directly across the river from this complex of industrial remains, there is a furnace-like structure made of cut stone, approximately 10 feet high, with a brick-lined arched opening about 5 feet wide and 10 feet deep. It is within 20 feet of the current north bank of the river built into and filling a large opening in the rock bank. It appears to be some type of furnace, although the brick does not show signs of great heat; local informants suggested it was part of an old nail factory. There are also several stone building foundations in the immediate area.

The site of a mid-19th century charcoal iron furnace occupies a small gully on the south bank, approximately 100 yards upstream from Route 7. This immediate area contains the furnace stack; a charging ramp; machinery foundations; building foundations; a large stone head race, with stone posts; and quantities of glassy slag.

The furnace stack is in ruinous condition, with most of the

south side collapsed. Two corners and the included north side, with a triangular tuyere opening, are largely intact. The furnace is made of stone, and is about 30 feet square at the base and 20 feet high. It is reinforced with iron tie rods. Although the furnace is partially collapsed, it appears that most of the stone is still on the site, adjacent to the stack. South of the stack and extending south to Old Forge Road, is what appears to be a graded charging ramp, on two levels with cut stone retaining walls. It is about 30 feet wide and 75 yards long, and contains much slag. It ends abruptly about 40 feet from the furnace stack.

There is a stone platform, surfaced with concrete, located about 30 feet southwest of the furnace stack. It is about two feet high, ten feet wide and eleven feet long, and appears to be a foundation, possibly for a blowing engine or a hot blast oven. About 50 feet upstream from the stack and foundation and adjacent to the west bank of the gully, there are several stone foundations ranging from two to six feet high. Adjoining those foundations is the end of the head race, with what appears to be stone gates or reinforced posts, possibly for the installation of water power machinery.

The head race is built up of cut stone on the river side to a height of about ten feet, and extends upstream to within 200 feet of the current I-95 highway bridge foundations. The race is from 15 to 40 feet inland from the current river bank. In the vicinity of the upstream end of the race, many large stones both fixed and loose, on both banks of the river, show bore holes two and a half inches in diameter--indicating the presence of a substantial dam.

It should be noted that, upstream from the I-95 bridge, there is a large group of remains including bridge abutments and stone building foundations. Building foundations appear to be industrial, likely date from the early to mid-19th century, and may have been related to the iron industry.

The land along the Little Gunpowder is apparently State-owned. On the Big Gunpowder, the portion downriver from Route 7 is State-owned. According to local informants, however, the gully site, containing the furnace stack, is owned by Mr. Sam Salvo of Baltimore County.

Summary: major above-ground remains on the Gunpowder River site

Little Gunpowder River:

Several stone building foundations

Big Gunpowder River:

One furnace stack

One head race

Several stone building foundations

One dam

One re-heating furnace

History

During the mid-18th century, a substantial part of the land in the vicinity of both Gunpowder Rivers and the areas now known as Bradshaw and Jerusalem, was patented by ironmaster Stephen Onion. Onion had extensive experience with several Maryland iron enterprises before setting up his own works on the Little Gunpowder River in 1744, achieving a goal he had not been able, in his own words, "to compleat for himself for above twenty years." Onion's

works were apparently successful, and through the 1740's he continued to acquire more land, over 3300 acres in what is now Harford County and about 2800 acres in Baltimore County. He died in 1754 and was described as "owner of the Iron Works on the Gun Powder River, a Gentleman of good character and plentiful fortune." In fact, he left an estate appraised at over £8300, not including an operating ironworks and about 700 acres of land. He was survived by his wife and nephew. The latter inherited Onion's ironworks and operated it until 1769 when it was put up for sale. In an advertisement for the sale, the ironworks were described as follows: "Onion's Iron Works, consisting of two large forges, a furnace, a grist mill, a saw mill, seven dwelling houses, a chair house, . . . all the above in a circumference of 500 yards." (Maryland Gazette, August 17, 1769). The whole enterprise was described as being situated at the head of navigable water on the Little Gunpowder River within one mile of Joppa. The use of these works after sale is not known. The facilities were still in existence but apparently inactive in the 1780's. Dennis Griffith's map does not show an ironworks on the site in 1794.

The Big Gunpowder River was the site of a number of important ironworks during the 18th and 19th centuries. The Ridgely family was among the first to utilize the power of the Gunpowder River for producing iron products. In 1762, Charles Ridgely secured patents for two 100-acre tracts, one on Patterson's Great Run and the site of Northampton Furnace, and the other on the south side of the Big Gunpowder. The latter tract was evidently the site of the two forges set up by Charles Ridgely and known as

the Long Calm Forges--named for the adjacent river area of the same name--erected within a half mile of the old Philadelphia Road bridge.

In 1765, a group of men led by James Russell and Alexander Lawson, and called the Nottingham Company, patented 100 acres near the mouth of the Big Gunpowder on the south bank. This may have been a move to secure already-existing operations, since notices in the Maryland Gazette indicate that the Nottingham Company had been in operation since 1746 and had engaged in iron-making operations in the Gunpowder River neighborhood since 1754.

Both Ridgely's and the Nottingham Company's enterprises were extensive and successful during the years preceding the American Revolution. But during the War, Ridgely's works produced munitions for the Continental side, while the Nottingham Company was confiscated because of partial British ownership or Tory predilections on the part of some of its owners. After confiscation, the Nottingham Company was inventoried by State officials in 1781. At that time, the Company had one furnace; a large plantation--and possibly a forge--at White Marsh; one iron mine in Anne Arundel County; two gristmills; and at least one forge, probably the Nottingham Forge on Deer Creek. It was a well-equipped firm, which sold pig iron in England and which also produced fire backs, iron weights, and stove plates.

The Nottingham furnace was probably located on the south side of the Big Gunpowder, close to the Long Calm Forges. When the Nottingham assets were auctioned by the State, the furnace was purchased by Charles Ridgely, who then operated it along with his other furnace and forges.

Unlike many iron furnace operators, Charles Ridgely advertised his wares in the newspapers and his notices suggest the range of products of 18th century furnaces and forges: "Cannon (from Nine to Two-Pounders), Bar-Iron, pig iron, pots from 15 gallons to three quarts, kettles from 45 to 15 gallons; Dutch-ovens, tea-kettles, skillets, salt-pans, flat-irons, mortars and pestals, waggon-boxes, stoves, dripping-pans and bakers. . . N.B. Castings of any sort made on the shortest notice."

The Ridgely family got into the iron industry with forge operations at Long Calm, and continued to produce and work iron along the Big Gunpowder until about 1845 when their enterprises were purchased by Robert Howard. At that time, Ridgely's works had been inactive for some years prior to sale, perhaps even prior to the death of Governor Ridgley in 1829.

Robert Howard owned several other iron furnaces, forges, and iron-finishing installations in the Baltimore area, all part of what he called the Great Falls Iron Company. It included the Locust Grove Furnace at Stemmer's Run and the Elk Ridge Furnace. In 1846, Howard built a new hot blast charcoal furnace on the Big Gunpowder, probably on the site of the earlier Nottingham--Ridgely furnace. It was 31 feet high and 8 feet in diameter at the boshes, and produced foundry and forge iron. It was apparently a water-powered furnace, and operated until about 1860. This furnace is probably the one now standing on the site on the south bank, just upstream from Route 7. Howard's operation on the Big Gunpowder also included a flour mill, saw mill, store house, church, dwelling and farm houses, and over 3,000 acres of land.

About one half mile downstream from Robert Howard's furnace and Route 7, is the location of the Joppa Iron Works. It was reportedly situated near the B. & O. tracks and on the south bank of the River. The Joppa Iron Works was begun in 1820 by J. W. and E. B. Patterson, and was also known as Patterson's Nail Mill. It was rebuilt in 1851 and had six puddling furnaces and one heating furnace; two trains of rolls; 37 nail-making machines and one water-driven hammer. This was a major operation for its time; it was able to produce 34,000 kegs of nails a year. It was in operation until 1860 and the ruins were reported to be still standing in 1911.

Interpretive potential

Because this is so diffuse an industrial area, it is difficult to summarize its importance in a neat package. Much industrial activity has occurred here; in fact, along with the Baltimore area, this was, during the Colonial years, one of Maryland's centers of the iron trade. No fewer than 3 major ironworks--Nottingham Furnace, Onion's Works, and Ridgely's forges--operated here from the early 18th century through the remainder of the colonial years. Each of these enterprises was operated by persons who played a major role in the overall development of the Maryland iron industry.

During the Revolution, the Ridgely family's ironworks produced weapons and ammunition for the Continental side, while Nottingham--one of the Colony's largest ironworks--was confiscated.

Both Gunpowder Rivers were the sites of continued iron production through much of the 19th as well as the 18th century. Onion's works apparently did not survive the Revolutionary years, but iron continued to be smelted in the Ridgely family's areas

until past mid-century. Secondary iron manufacture was extensively carried on, with such diverse products as nails, shovels, and steam engine parts being manufactured here until well along in the century.

It is worth noting that this is an area of some general historic interest. It was an important Maryland port area in the 18th century--Joppa was within a mile of Onion's works--before the rivers silted up. It was along the line of Maryland's major overland travel route, from Baltimore to Philadelphia and some sections of the 18th century post roads still exist in this area. These two valleys are still marked by numerous other remains of the earlier days, including building foundations and dam site and bridge abutments.

Most of the changes which have occurred on this land (except for successive highways and bridges) have been related to the iron industry, so the remains, both above-ground and to be revealed by archeological investigation, are part of a continuity of iron-making, rather than obliteration of it. The major sites are undisturbed. The site of Ridgely's forges and the 19th century Great Falls Iron Co., as well as probable site of the Nottingham Co.'s furnace, is intact. The probable site of the Onion's colonial era works remains unaltered. Considerable industrial change has apparently taken place just at tidewater near the B & O railroad bridge on the south bank of the Big Gunpowder River but altogether, parts of the area are in a state of preservation that would repay handsomely any well-focused archeological efforts.

There are many public documents relating to all works during the colonial era. In addition, two valuable sources

are the extensive Ridgely papers in the Maryland Historical Society, which carry much on forges and post-Revolutionary furnace activity, and the confiscation records in the Hall of Records, which describe much about the Nottingham Co. facilities. Aside from Ridgely's works, no company records from the colonial era have been found. There are also a number of scattered but significant references to these works in travelers accounts and early maps, since they are all on main-traveled roads. While it is not a convenient "package" there are enough undisturbed areas, interesting above-ground remains, and historical data, that the interpretive potential of the Gunpowder River area is good.

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FURNACE STACK AT NASSAWANGO FURNACE

Remains

Nassawango Furnace is located on a creek of the same name, about five miles northwest of Snow Hill and near the intersection of Old Furnace Road and Maryland Route 12.

There are few remains on the site, but what is there is a significant survival of the 19th century iron industry. A furnace stack, with much of its integral hot blast apparatus intact, is still standing on the south bank of Nassawango Creek. The stack is constructed of stone and brick, with iron hot blast tubes built into the top portion. The stack has two tuyere openings, plus a casting hearth, at the base. It is 24 feet square at the base, about 35 feet high, and 8 feet in diameter at the boshes. The casting arch is 12 feet wide at the base, 10 feet high, and 7 1/2 feet deep. The furnace stack is in unusually good condition; it appears that some modern repair has been performed on the stack, especially at the top, near the hot air tubes. None of the auxiliary buildings or workers' houses has survived.

Foundations of the dam now serve as a causeway for Old Furnace Road. A race, about 20 feet wide extends from the aforementioned road to the furnace stack, along the west bank of the creek. The race ends at what appears to be a wheel pit, near one corner of the furnace stack. An embankment, probably the base of the casting bridge, has survived.

History

Nassawango Furnace was erected in 1830 by Mark Richards,


NORTH
OLD FURNACE ROAD
NASSAWANGO Creek
NASSAWANGO FURNACE

of the Maryland Iron Company to smelt iron from the bog ore formations in the immediate vicinity. It is the only furnace in Maryland ever to make extensive use of bog ore and the only furnace ever on Maryland's Eastern shore. During the 1830's and 1840's under the ownership of Thomas A. Spence, it was able to produce as much as 700 tons of iron per year, but the quality and distribution of the bog ore may have caused the several financial failures which the ironworks underwent. It operated only until 1849, and was reported to be in dilapidated condition by 1859.

The Nassawango Furnace was successful enough to be the reason for a small village to exist in the area. In addition to the usual iron furnace auxiliary buildings, there were workers' houses, a hotel, store, church and grist mill, in the nearby area. The most significant fact about the furnace is that it employed hot blast techniques only a few years after the idea was developed in England in 1828-1830. If the Nassawango Furnace was built with the hot blast gear installed from the beginning, and not later converted, it would have to be one of the first hot blast furnaces in America. It is more likely that the equipment was added late in the life of the furnace, but it would still qualify as a very early example of the hot blast technology. Mr. Edward Heite, historical registrar of the State of Delaware, has studied Nassawango Furnace and has suggested that the blast apparatus was likely added to the existing stack during a time of ownership change, either in 1837 or 1840.

The property is currently owned and maintained by the Worcester County Historical Society.

Interpretive potential

The interpretive potential of Nassawango rests on the excellent condition of the surviving furnace stack, and on its technological importance. It is unusual for a 19th century charcoal furnace to have survived with a major part of its iron hot-blast equipment intact. Nassawango is also interesting as one of a very few iron-making etnerprises on the Eastern Shore, and the only one in Maryland to have depended primarily on bog iron ore for its raw material.

In addition, the Nassawango Furnace was an economic enterprise of substantial local importance during its years of operation; it generated an entire village.

The Furnace occupies an undisturbed site--which means that it is itself likely to be a useful source of information. Documentary information, however, is not extensive. While it is likely that some additional local descriptions of the ironworks and village may yet be found, no business records from the companies which operated the facilities, have been located.

Nevertheless, because of its location, its excellent surviving structure, its archeological potential, and its technological importance, Nassawango is an appealing site--one with real interpretive potential.

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MODERN FURNACE VILLAGE NO CAMOUFLAGE PLEASE

Remains

Catoctin Furnace is located twelve miles north of Frederick, along both sides of current U.S. 15, and a parallel road, Maryland Route 806 (old U.S. 15). Except for the relocation of U.S. 15, there has been little change, or development in the area since the ironworks stopped operations at the beginning of this century.

Catoctin is a large site, which includes three major parts: the furnace area, just west of Route 806 and south of Catoctin Furnace Road; the adjacent village of Catoctin Furnace, mostly distributed along Route 806; and the ore pits and water power developments, generally west of the furnace site, along the east base of Catoctin Mountain.

In the furnace area, there are a number of above-ground remains. Nearest the Catoctin Furnace Road, there is a complex stone wall, about 75 feet long and 25 feet high, which appears to be both retaining wall and foundation. In an ell formed by that wall stands a furnace stack made of cut stone. It is 26 feet square at the base and about 30 feet high. There are two tuyeres, of arched brick which still contain remains of large diameter iron pipe. The hearth side of the furnace stack faces east, overlooking the site of the former casting house. The top of the aforementioned wall was probably used as a charging area for the furnace.

The stone retaining wall continues west of the furnace about 65 feet but includes some changes in plane which suggests that it may have been part of a structure. The wall then continues on a north-south line for over 125 feet. This wall was part of


Little Hunting Creek
Md. Rte. 806 (old U.S. 15)
OLD CHARCOAL ROAD
NORTH
CATOCTIN FURNACE

a coal or ore shed, as well as being a retaining wall.

The area adjacent to the south end of the wall is the site of a late 19th century blast furnace, hot air oven and steam blowing engine. There are foundations and iron tie rods remaining above ground, which were probably anchor points for some heavy equipment. In the same furnace area, there are other unidentified stone outcroppings which may have been foundations of other buildings. There is also a grade for a railroad which crossed Route 806.

North of the Catoctin Furnace Road, the remains of a large two-story stone, brick and stucco house are falling into ruin. Most of the house probably dates from the mid-19th century, and it may have been the ironmaster's house. This building had an intact roof and was still usable as recently as the 1940's.

South of the furnace area, along Route 806, are small houses, probably built for iron-workers during the 19th century, although some may be older. There are 11 homes of stone, log, or frame construction, the remains of what was likely once a larger village. One of the biggest log structures has long been used as a local store. South of the existing houses, and between Route 806 and U.S. 15, there are many stone outcrops and holes, suggesting additional building foundations.

Water to power the furnace bellows reportedly was drawn from Little Hunting Creek at some point north and west of the furnace area. In this direction, within a half-mile of the furnace, there are remains of a dam, and a head race. Farther upstream, west of U.S. 15, there is another dam site, a water control gate and an additional race. South and west of the

furnace, there are several large depressions, which may be the remains of limestone or iron ore mines. In 1969, a narrow-gauge ore car was retrieved from a once-submerged shaft in one of these large pits.

On the east side of Route 806, there are several concrete and stone building foundations, possibly associated with the railroad which once traversed the furnace site. Also in this area, there are large slag heaps along Little Hunting Creek.

Iron ore was also mined from banks north of the furnace, along the lower edges of Catoctin Mountain. Charcoal was secured from the nearby mountain forests, and State park officials have identified and marked some of the charcoal-burning areas.

Summary: major above-ground remains at Catoctin Furnace

One furnace stack

One foundation/retaining wall

One deteriorated large house

Several stone building foundations

One race

Numerous village buildings, including houses, sheds, store and church

History

By mid-18th century, Dr. Charles Carroll of Annapolis, the driving force behind the successful Baltimore Iron Works, had become interested in iron-bearing land in Western Maryland. Specifically, he patented a tract in Frederick County in the 1750's. Carroll died before any development was undertaken, and one of his heirs conveyed the land along Little Hunting Creek to members of the Johnson family.

It is on this tract that James and Thomas Johnson erected the first Catoctin furnace. Completion date of the furnace and the related facilities is not now known, but a letter from Thomas Johnson to the Council of Safety, July 22, 1776, indicates that the furnace was near production: "My brother is getting his furnace into blast with all diligence, and hopes to effect it within a fortnight." . . . "We shall also attempt to case such guns as are wanted but cannot contract for them at all events because the metal may not suit, though we have every reason to expect it will. If we succeed in making good guns the public may have them delivered at Baltimore at 40£ a ton. . . ."

There is no later correspondence to prove that Catoctin furnace actually succeeded in supplying weapons. However, there are two letters from Secretary of War Henry Knox to John White of Annapolis which do state that James Johnson & Co. had "furnished" shells for the Continental Army in 1780.

The owners rebuilt this furnace in 1787 or else built a completely new one in the vicinity. In 1793, the Johnson family reorganized its holdings. Thomas Johnson got two-thirds of the Co.; Baker got one-third, and ran the iron operation until 1803 when he bought Thomas Johnson's share.

During the 18th century, members of the Johnson family operated other iron enterprises in conjunction with Catoctin furnace. They started Bush Creek Forge at about the same time as the first Catoctin furnace. James Johnson operated it until 1810. James also ran a slitting and rolling mill in the vicinity of current Reel's Mill. Johnson Furnace, built about 1787, was located about a mile from the Potomac, at the confluence

of current Furnace Branch and the Monocacy River. It was active in iron production from 1793 to about 1810, under the supervision of Roger Johnson. Roger also ran Bloomsbury Forge, near Sugarloaf Mountain, during the same period.

Even before the Revolutionary War started, Thomas Johnson had gone into partnership with one Launcelot Jacques, an Annapolis merchant, and they set up the first charcoal furnace at Green Spring. It was located one mile upstream from McCoy's Ferry, on the Potomac River. Also during the 1770's, James Johnson built Licking Creek Forge at the mouth of Licking Creek, to make use of the pig iron supplied by Green Spring Furnace. While all these other enterprises were being conducted, the Catoctin furnace remained in use, owned by Baker Johnson, but leased to one Benjamin Blackford in 1803. After that ten-year lease expired, the property was purchased by Thomas and Willoughby Mayberry. The latter operated the works until 1820, when it was bought by John Brien.

In 1831, Brien rebuilt the original stack again, enlarging it to a height of 33 feet and to an interior width of 9 feet. During the early years of the 19th century, the major output was hollow-ware, i.e., cast utensils. Stoves were also an important product.* John Brien's heirs sold the works in 1843 to Peregrine Fitzhugh, who laid out the town of Catoctin Furnace in 1848. In 1856, Fitzhugh took in a partner, Jacob M. Kunkel. These two erected a second furnace in the next year, adjacent to and about the same size as the re-modeled furnace of 1787.

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*A ten plate stove from Catoctin Furnace is on display in the Dresser Room, The Henry Francis du Pont Winterthur Museum, Delaware.

This second furnace was a charcoal-burning, cold blast model. By 1858, both furnaces had been outfitted with steam-powered, vertical, direct action blowing engines.

Fitzhugh and Kunkel--and later, Kunkel's two sons--concentrated on producing pig iron with the 1857 furnace. During all this era, the smelting operations were conducted with iron ore mined in the nearby Catoctin Mountain area. Local limestone was used for flux. Charcoal was burned in the forest and brought by wagon to the furnace. In 1860, Kunkel's total capital investment at Catoctin was valued at $100,000. There were 90 employees and production was about 4500 tons per year.

The third, and technologically most advanced, furnace was erected in 1873 by John B. Kunkel. This was an anthracite coal or coke burning hot blast furnace, blown by steam power. It was a cylindrical iron stack, 50 feet high and 11 1/2 feet inside diameter. With its auxiliary equipment, it was located near the south end of the current retaining wall. It had a production capacity of 35 tons of pig iron per day; at that time, the works concentrated on making iron suitable for car wheels, foundry and milling use. During the time he owned the works, John B. Kunkel expanded the land-holdings to some 11,000 acres and is reported to have employed 300 woodcutters and coalers (charcoal-burners), along with some 100 miners, many of them Italian immigrants brought from Baltimore.

When John B. Kunkel died in 1885, his children set up the Catoctin Iron Co., which went into receivership within two years. A Catoctin Mountain Iron Co. was then formed and operated the works until 1892 when it went into receivership. The furnaces

were idle for much of the 1890's, until sold to the Blue Mountain Iron and Steel Co., a group of men from Baltimore and Philadelphia. They produced about 40 tons of pig iron per day from 1900 to 1903, when the works shut down again. J. E. Thropp, an ironmaster from Everett, Pa., purchased all assets in 1905 but never ran the plant. Instead, all equipment was dismantled and either sold or moved to Thropp's works near Everett. The Catoctin Furnace never operated again. The land was purchased by Lancelot Jacques and associates in 1923, who eventually sold much of it to the National Park Service in 1937.

Interpretive potential

The site at Catoctin Furnace offers an opportunity to interpret an unusually long-lived ironworks in the western part of the State, one which includes an array of well-preserved above-ground remains. The productive life of the works in Frederick County began only just inside the bounds of the colonial days, but that productive life spanned the entire 19th century, and included expansion to a quite large enterprise for the place and time. It encompassed the major technological changes in the American charcoal iron industry.

The Catoctin Furnace enterprise is significant in the westward movement of economic activity in Maryland. It was a pioneering enterprise of one of Maryland's most important families; one of the founders of the Catoctin works was Thomas Johnson, a patriot leader and later the State's first governor. The Johnson family was prominent in the development of western Maryland resources, and was involved in many of the early

ironworks of Frederick and Washington Counties,--of which Catoctin Furnace is the best survival.

The major historical interest of the site now, is its compact, unified, "company town" aspect. There are other furnace stacks which date from the mid-19th century, but while most of the Maryland iron enterprises of any size did generate a small surrounding community--of workers housing, perhaps a store, or church or two--not much of these communities has survived to the present day; Catoctin is almost unique in the extent to which, the surrounding buildings related to iron-making have survived--and indeed, are still in use. The present village of Catoctin Furnace (and probably a certain number of houses in the nearby area) owes its very existence to the decades of iron-making at the foot of the Catoctin Mountains.

Altogether, this was an unusually compact enterprise, with iron ore and limestone being mined in the area along the Catoctin Mountain; with timber for charcoal being cut on the nearby forests; with all iron-making, whether water- or steam-powered, being concentrated in the one small and still undisturbed area; with the town growing up around the works--and that town remaining intact. Catoctin Furnace is a rare opportunity to examine the growth, through the entire 19th century, of a small industrial town.

There is much secondary information available which is descriptive of the iron works end of life in the immediate area; the attached bibliography contains a suggestion of the materials which are available.

Unfortunately, the records kept by various owners and

partners who operated the iron-making facilities at Catoctin have not been found, but it does not appear that serious searches have been conducted outside the immediate Frederick County area.

Enough documentary material exists to make an accurate interpretation of the Catoctin works. It is likely that much valuable information may be gained from some archeological investigation. Some preliminary exploration has been done by the Park Service and by Contract Archeology, Inc. The Catoctin area has been disturbed only by successive developments of the iron manufacture itself, and hence the ground may hold data on the changes and developments which took place during its long history of operation.

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NORTH
Antietam Creek
Harpers Ferry Road
Lime Kiln Road
Potomac River
Antietam Furnace

Remains

At a bend in the Creek, just upstream from the Antietam bridge, there is about half a dam. Anchor points on both banks are intact, but Antietam Creek passes through a substantial breach on the north side. The dam is constructed of large blocks of cut stone, with numerous iron rods, one inch in diameter, projecting vertically from the top layer of stone. It is over 50 feet long, ten feet thick and about ten feet high, on the downstream side.

There is an opening for a race at the south end of the dam. The race is formed by two walls of cut stone, set 20 to 25 feet apart. Most of the race walls are intact, especially the south wall, which forms an embankment for the current road (Harper's Ferry Road). The entire race is over 200 feet long and the west (downstream) end of it leads into a narrower, stone-lined passage which continues west until graded over by a cottage site. The north wall of the race is breached twice, apparently by design, in order to convey water north, i.e. parallel to the dam. On the north side, parts of the race wall include both cement, and iron reinforcing rods. From current ground level, the height of the walls varies from six to fifteen feet. The north race wall is ten feet thick. During the summer of 1972, a bulldozer scraped part of the race and passed through a hole in the north wall, partially disarranging the walls.

Between the north wall of the race and Antietam Creek, there are at least two parallel walls. These are constructed of cut

stone, and measure three feet wide, over twenty feet long, and are of varying heights. They are 20 feet apart and are set perpendicular to the flow of the creek. They appear to be the remains of either a water wheel pit, or a building.

Occupying the area between the downstream side of the dam, the north wall of the race, and the upstream side of the above-mentioned parallel walls, there is a raised earthen area, flat on top and measuring about 70 feet square and from 3 to 15 feet above the surrounding ground level. Mr. Joe Prentice of the National Park Service has suggested that this is the site of an iron furnace stack, probably the one most recently constructed (1845) at the Antietam site. While this area is almost entirely silted over, there are some outcroppings which suggest large stonework within. An abandoned frame cottage, with outhouse and trash dumps, now occupies the top of the site. In the immediately adjacent portion of the race, a number of cast iron fragments and iron reinforcing rods (of a different style from those on the dam), and large quantities of black slag, are visible.

Just upstream from the stone arch bridge, and below the dam, there is a stone wall running parallel to and adjacent to the creek. It extends about eight feet above the current water level and is about 20 feet long. It appears to be part of a building wall.

About midway along the race and on the south side of the Harper's Ferry Road, there is a stack set into the hillside, about 35 feet from the current road. It is 50 feet long at the base, exclusive of the adjacent retaining walls, and approximately

30 feet high. The stack is constructed of cut stone, smaller than the stone used in the dam and race. There are three arched entrances in the north face. Each opening is six feet wide, eight feet high and nine feet deep. Each is lined with brick and includes some iron reinforcement. The top of the stack is level and has three round holes, corresponding to the placement of the opening below. Two are partially filled with rubble, but the third is clear for most of the depth of the stack. It is cylindrical, about six feet in diameter, and appears to be lined with refractory brick. This stack is most likely a lime kiln, although it does bear a superficial resemblance to an iron furnace. It is quite possible that material from an earlier iron furnace was rebuilt into a lime kiln configuration or even that this structure incorporates part of an earlier iron furnace; there are anomalies of stone and construction on the west side. Presence of lime-burning activities in the immediate area is corroborated by numerous quarries and the ruins of a lime kiln less than a mile away along Lime Kiln Road--which intersects with Harper's Ferry Road. It is not known what connection, if any, this lime kiln had with the area iron enterprises.

Near the stack and dam, along the roads, there are numerous small houses of brick, stone and wood, making up the town of Antietam. Some of these probably housed iron workers. Just downstream from the stack are two buildings, a brick structure which was once the Antietam Post Office, and a stone and wood barn-like building. According to local informants, these two buildings were likely related to the 19th century iron business.

On the north side of the creek, Mr. and Mrs. Floyd Richard Burgon live in a house which was built on the foundations of a large house that had served as a boardinghouse for iron workers, according to a 19th century photograph in the Burgon's possession. The Burgons also own two fractured pieces of cast iron stove plate, and a cast iron "pig" which they found on their property.

The stack and the two nearby buildings, and about three acres along the south side of the Harper's Ferry Road are owned by Mr. Otzelberger, who lives in the old post office. The remainder of the ironworks site, including dam, race and all foundations along the creek, is owned by Mrs. Abby Draper of Sharpsburg, Maryland.

Summary: major above-ground remains at Antietam

One dam

One stone race

Several stone foundation walls

One stone lime kiln

History

The town of Antietam, at the confluence of Antietam Creek and the Potomac River, has been the site of extensive iron-working facilities during most of the century following 1765. In that year, a company was formed for the purpose of producing iron. Principals were Joseph Chapline, founder of Sharpsburg and owner of the Antietam land, Samuel Beall, Jr., David Ross and Richard Henderson. Henderson and Ross built the first furnace and forge (often called "Frederick Forge" at that time) on the site, which were likely in operation by 1775. Ore and wood for charcoal were

obtained from the Company's large landholdings in the South Mountain area. Pig iron was the major product; it was used in the various forges then operating in western Maryland. The brothers Samuel and Daniel Hughes gained control of Antietam and other ironworks in the Antietam valley, just prior to the outbreak of the Revolutionary War.*

Under the direct supervision of Samuel Hughes, Antietam furnace began producing cannon for the Baltimore Town Committee of Correspondence, for the Continental Marine Committee and, through Congress, directly for the Continental Army. Although four out of the first five iron cannon cast by Samuel Hughes exploded on the test-firing (killing George Matthews, a founder and would-be cannon maker from the Kingsbury Ironworks), Hughes settled down to producing quantities of nine-, twelve- and eighteen-pounders and ammunition. The reputation of Hughes' products spread to General George Washington, who wrote the Board of War Headquarters on April 2, 1779: "Upon consulting General Knox, it is our opinion that the contract with Mr. Hughes for the thirty eighteen pounders should be renewed, as the cannon are absolutely necessary and it does not appear that they can be procured from any works so soon as from his . . ." Antietam cannon were used to fortify Whetstone Point in Baltimore, and the Continental frigate Virginia was armed with 24 twelve-pounders and 6 four-pounders from Mr. Hughes works.

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*Among all sources, there is persistent confusion about names and identities of Hughes-operated ironworks, viz. Antietam Furnace and Antietam Forge Furnace; Rock Forge Furnace, Great Rocks Furnace (and forge), and Black Rock Furnace.

Cannon were cast, bored and proved by Hughes at the Antietam Iron Works (and probably at other Hughes-owned ironworks as well). They were then transported by wagon to Baltimore for delivery. The price varied from £36 10s to £40 per ton of finished cannon.

At the end of the Revolutionary War, Samuel Hughes terminated his iron-making operations in Washington County and from 1786 to 1789 sold or leased his property there. Hughes moved to the Susquehanna River area and in 1786 got into the iron-smelting and cannon-casting business at Principio with what he called Cecil furnace (see above). After the departure of Samuel Hughes from Washington County, the furnace at Antietam may have been inactive for a time; Dennis Griffith's 1794 map of Maryland shows only a forge on the site at the mouth of Antietam Creek. In 1805, the entire ironworks, grist mills, stock, slaves, and property (7000-8000 acres) was advertised for sale. An 1808 map shows the site to have a furnace, forge and grist mill.

In the 19th century, the original furnace and forge operation continued, perhaps as late as the 1850's. It was jointed by a number of other, related enterprises, all utilizing the power of Antietam Creek. In 1831, a nail factory, with 25 nail-making machines was set up, along with a small rolling mill, which consisted of two heating furnaces and two trains of rolls. These enterprises employed over 250 laborers, including some 60 slaves. The nail works, owned by John M. Brien, burned in April, 1841. It was rebuilt and increased in size, and continued to operate until about 1853, when Brien sold the ironworks to William B. Clark for $54,500.

A second charcoal furnace was erected at Antietam in 1845. It was 50 feet high and 15 feet wide at the boshes. In one 20 week period of 1857, this furnace is reported to have produced 1,465 tons of iron, a capacity greater than that of the first furnace at Antietam. During the years preceding the Civil War, the entire works, in addition to the above-mentioned furnaces, included: a sawmill, which produced such items as shingles; a nail factory which produced 400 to 500 bags of nails and spikes per week; a forge with six heating fires and a 21-ton hammer; a rolling mill which produced plates, rods, nail stock and bar iron; three puddling furnaces and an air furnace which produced finished iron; and a merchant grist mill. Antietam Creek had a head of water of at least 20 feet of fall, and all these enterprises were operated by no fewer than nine water wheels.

During the late 1850's and early 1860's, the Antietam ironworks was owned by John Horine--who had other iron manufacturing interests--and the heirs of William B. Clark. It was managed by Jacob Hewitt, of Sharpsburg. The works apparently suffered some damage during the Civil War. Afterwards, it was rebuilt and acquired by the Ahl family of Carlisle, Pa. (P. A. Ahl & Bros.), who converted the furnace to coke fuel and operated it until about 1880. In 1873, a flood broke the dam, and among the subsequent improvements was construction of an improved hot air oven. During this period, the furnace was smelting ore mined near Harper's Ferry, via the Chesapeake & Ohio Canal. It was idle during most of the 1880's and was dismantled in 1891.

Interpretive potential

The historical significance of Antietam rests on the fact that this was the site of a large variety of substantial iron-working enterprises over a long period of time, from the colonial years on through much of the 19th century.

It was one of the operations conducted by the Hughes Bros. who were major suppliers of weaponry to the Continental forces. There is strong evidence that a large number of Revolutionary War cannon were cast at this site. Hughes' operation was the largest military iron production facility in Maryland.

Over the years, the Antietam area developed a complete metal-working facility, all run by the power of Antietam Creek. It appears to have been an important part in the local economy, and a valuable asset in the Potomac Valley conveniently situated for supplying iron and iron products to the settlers migrating west and south during the last years of the 18th and the early years of the 19th centuries.

No company records from the various Antietam operations have been found. There are numerous references to the Antietam works in general history books or in histories of iron in the colonies and in some primary documents from the Revolutionary War. There are also some local records and accounts of the ironworks and the life associated with them. The Antietam site contains some interesting remains--which suggest a large-scale iron operation. But for its full interpretive potential to be realized, Antietam requires additional research, both on-site and documentary.

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